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(54) **APPARATUS AND METHOD FOR VARYING THE PITCH BETWEEN MOVING ARTICLES**

VORRICHTUNG UND VERFAHREN ZUR VERÄNDERUNG DES ABSTANDS ZWISCHEN SICH BEWEGENDEN GEGENSTÄNDEN

APPAREIL ET PROCÉDÉ POUR FAIRE VARIER LE PAS ENTRE DES ARTICLES EN MOUVEMENT

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Description

Field of the invention

[0001] The invention relates in general to manufacturing and/or packaging of articles moving at a high-speed in a production/packaging line.

[0002] More specifically, the invention relates to an apparatus and to a method for changing the pitch - operation also known as "pitch change" or "re-pitching" - between articles being conveyed.

[0003] The invention has been developed with particular attention to the field of manufacturing or packaging of sanitary articles, such as sanitary pads, pantry liners, diapers, training pants, paper towels, female hygiene products, face masks, plasters, etc.

[0004] The scope of the invention is not in any case limited to this possible field of application.

Description of the related art

[0005] The state of the art regarding re-pitching devices is somewhat extensive in terms of the relevant patent literature.

[0006] In this connection, reference may be made, for example, to documents such as US-A-4 880 102, US-A-5 480 021, or US-A-4 506 779 and also to US-A-4 726 876, US-A-3 728 191, and US-A-4 483 351 and EP-A-1 179 495, which disclose rotary repitch apparatuses. From the latter three documents cited there is known the possibility of obtaining, together with the variation of the pitch, an orientation of the articles with a combined action, referred to as "turn and repitch".

[0007] The main disadvantage of rotary repitch apparatuses is the need to provide a plurality of motors dedicated to several shoes for periodically accelerating and decelerating the shoes during rotation, thus making the apparatuses complex, cumbersome and expensive. Another disadvantage is the need to stock many spare parts.

[0008] Documents WO-2012/009491-A1 and US-6000528-A disclose different apparatuses for transferring articles, adapted to vary the linear speed of the articles conveyed on transport elements. The apparatus of WO-2012/009491-A1 comprises a first transfer surface driven by a first motor and second transfer surface driven by a second motor. The first and second transfer surfaces receive and transfer different portions of an article at different speeds such that a desired amount of spacing can be provided between discrete articles. Thus, the spacing between the trailing end of a previous article and the leading end of a subsequent article can be desirably controlled by adjusting the acceleration/deceleration of movable surfaces of the apparatus. Therefore, the apparatus of document WO-2012/009491-A1 results inappropriate for changing the pitch of moving articles easily and efficiently. In particular, US-6000528-A discloses an apparatus for varying the pitch between moving articles according the preamble of claim 1. US-6000528-A discloses moreover a method for varying the pitch between moving articles, including:- feeding a flow of articles along a machine direction spaced apart from each other in said machine direction by a first pitch, - receiving said flow of articles spaced apart from each other by said first pitch on a closed-loop central belt having a transport branch extending between an infeed section and an outfeed section,- retaining said articles on said transport branch of the closed-loop central belt by vacuum suction during the movement between the infeed section to the outfeed section, wherein said articles have a width in a direction transversal to said machine direction greater than the width of said closed-loop central belt so that said articles have lateral portions projecting laterally outside said closed-loop central belt, - driving said closed-loop central belt at a first speed, - providing a pair of closed-loop side belts extending on opposite sides of said transport branch of said closed-loop central belt, wherein the closed-loop side belts comprise respective rows of stop elements, the stop elements of each closed-loop side belt being spaced apart with respect to each other by a constant distance, and wherein the stop elements of each side belt are aligned to the stop elements of the other belt in a direction transversal to said machine direction, - synchronously driving said closed-loop side belts at a second speed different from said first speed, - engaging said lateral portions of said articles projecting outside to closed-loop central belt with respective pairs of transversally aligned stop elements of said closed-loop side belts, and spacing said articles from each other in said machine direction at said outfeed section by a second pitch corresponding to said distance between said stop elements.

[0009] In view of the above, there is the need of a solution adapted to vary the pitch of moving articles which results simpler and less complex than the prior art.

Object and summary of the invention

[0010] The object of the present invention is to overcome the drawbacks and limitations of the prior art.

[0011] Another object of the present invention is to provide an apparatus of the type indicated above, which ensures an excellent stability of the articles during the repitch operation.

[0012] According to the present invention, these objects are achieved by an apparatus having the features of claim 1.

[0013] According to another aspect, the invention relates to a method for changing the pitch between moving articles having the features of claim 11.

[0014] The claims form an integral part of the disclosure provided here in relation to the invention.

Brief description of the drawings

[0015] The present invention will now be described in

detail with reference to the attached drawings, given purely by way of non-limiting example, wherein:

- figures 1, 2 are a perspective view and a plan view illustrating a first embodiment of an apparatus according to the invention,
- figure 3 is a perspective view showing a second embodiment of an apparatus according to the invention, and
- figure 4 is a perspective view showing further features of an apparatus according to the present invention.

Detailed description

[0016] With reference to the figures, an apparatus for varying the pitch between moving articles is indicated by the reference numeral 100. In general terms, the apparatus 100 according to the invention is configured to vary the pitch between adjacent articles A in a continuous flow of moving articles A advancing along a machine direction MD.

[0017] The apparatus 100 comprises a phaser conveyor 1 having an infeed section 10 and an outfeed section 11, wherein the infeed section 10 is configured for receiving a flow of articles A which advance with a first pitch P1. By way of non-limiting example, the figures refer to a phaser conveyor 1 of the motor-driven-belt type.

[0018] The apparatus 100 comprises an infeed conveyor 8 configured for feeding the phaser conveyor 1 with a flow of articles A along a machine direction MD, in which the articles A conveyed by the infeed conveyor 8 are spaced apart from each other in said machine direction MD by a first pitch P1. It is to be noted that the infeed conveyor 8 is described in detail in a subsequent section of this description.

[0019] According to the invention, the phaser conveyor 1 comprises a central belt 2 having a transport branch 20' which extends along the machine direction MD. As shown in figure 2, the central belt 2 is a closed-loop belt having a flat support surface 20 configured for receiving thereon the articles A.

[0020] The closed-loop central belt 2 is wound about two pulleys 12, 13, at least one of which is driven by a first motor 5. The first motor 5 is configured to continuously drive the central belt 2 along the machine direction MD at a first speed V1.

[0021] The phaser conveyor 1 comprises a plurality of idle support rollers 7 which support the transport branch 20' of the central belt 2.

[0022] It is to be noted that the apparatus 100 is configured to stably retain the articles A on the central belt 2 during transfer from a gripping position to a release position, and to stop the retaining action of the articles A in the release position.

[0023] In this connection, the apparatus 100 comprises a vacuum grip system including a stationary suction box 50 connected to a sub-atmospheric pressure source and having a suction surface facing the transport branch 20' of the closed-loop central belt 2. The closed-loop central belt 2 has a plurality of through holes 21 open on the flat support surface 20 and facing the stationary suction box 50, so as to provide a gripping condition for the articles A on the transport branch 20' during the movement from the infeed section 10 to the outfeed section 11. The vacuum gripping condition remains active to retain the articles A on the transport branch 20' during the path in which the through holes 21 face the stationary suction box 50, in the path from the infeed section 10 to the outfeed section 11.

[0024] According to the invention, the phaser conveyor 1 comprises two closed-loop side belts 3, 4, having respective branches extending on opposite sides of the transport branch 20' of the central belt 2. The side belts 3, 4 have respective support surfaces 24, 25 which may be coplanar with the flat support surface 20 of the transport branch 20' of the central belt 2 to form a continuous surface for supporting and transporting the articles A.

[0025] Naturally, the width of the belts 2, 3, 4 in a direction transversal to the machine direction MD can be different from what is illustrated, depending on the size of the articles A to be conveyed.

[0026] The side belts 3, 4 are driven by a second motor 6 configured to synchronously drive the side belts 3, 4 at a second speed V2 different from the first speed V1. As will be described in more detail in the following, the first speed V1 of the central belt 2 may be higher or lower than the second speed V2 of the side belts 3, 4.

[0027] As shown in figure 2, the side belts 3, 4 are wound on one side around two drive pulleys 15, 17 arranged on the same axis and powered by the second motor 6, and on the opposite side around two idle pulleys 14, 16 arranged on the same axis. As previously indicated, the central belt 2 is a closed-loop belt wound around two pulleys 12, 13, at least one of which is driven by a first motor 5. It is to be noted that the pulley 12 is a drive pulley arranged on the same axis of the idle pulleys 14, 16, and the pulley 13 is an idle pulley arranged on the same axis of the drive pulleys 15, 17.

[0028] According to the invention, the side belts 3, 4 comprise respective rows of stop elements 30, 40 configured to engage side portions of said articles A projecting laterally outside the transport branch 20' of the central belt 2. The stop elements 30, 40 of each side belt 3, 4 are spaced apart from each other in the machine direction MD by a constant distance X. The stop elements 30, 40 of each side belt 3, 4 are aligned to the stop elements 30, 40 of the other belt 3, 4 in a direction transversal to the machine direction MD. In a possible embodiment, the stop elements 30, 40 are ribs protruding from respective flat surfaces. In a possible embodiment, the stop elements 30, 40 are ribs having a width in a direction transversal to the machine direction MD equal to the width of the side belts 3, 4.

[0029] In operation, the phaser conveyor 1 transports articles A having a width in a direction transversal to the

machine direction MD greater than the width of the central belt 2. The articles are retained by vacuum suction on the flat support surface 20 of the transport branch 20' of the central belt 2 and advance in the machine direction MD at the first speed V1 of the central belt 2. The difference between the first speed V1 of the central belt 2 and the second speed V2 of the side belts 3, 4 causes the articles A to come into contact with respective pairs of transversally aligned stop elements 30, 40. When the articles A retained on the central belt 2 come into contact with respective pairs of stop elements 30, 40, they start to move in the machine direction MD at the second speed V2, so that they slide with respect to the flat support surface 20 of the central belt 2. At the outfeed section 11 the articles A are spaced apart from each other in the machine direction MD by a second pitch P2 corresponding to the distance X between the stop elements 30, 40.

[0030] In a possible embodiment, shown in figures 1 and 2, the speed V1 of the central belt 2 is higher than the second speed V2 of the side belts 3, 4. Consequently, in operation, an article A conveyed on the infeed section 10 of the phaser conveyor 1 reaches a pair of transversally aligned stop elements 30, 40 located in a more advanced position with respect to the article A, so as to make contact between a leading edge portion of the article A and said pair of transversally aligned stop elements 30, 40 at the outfeed section 11 of the phaser conveyor 1.

[0031] In a possible embodiment illustrated in figure 3, the side belts 3, 4 are driven with a speed V2 higher than the speed V1 of the central belt 2 which retains the articles A. Consequently, in operation, an article A conveyed on the infeed section 10 of the phaser conveyor 1 is reached by a pair of transversally aligned stop elements 30, 40 located in a back position with respect to the article A, so as to make contact between a trailing edge portion of the article A and said pair of transversally aligned stop elements 30, 40 at the outfeed section 11 of the phaser conveyor 1.

[0032] According to the invention, also the lateral belts 3, 4 comprise a plurality of through holes facing the stationary suction box 50, so as to provide a gripping condition for the articles A on the support surfaces 24, 25 of the side belts 3, 4 during the movement from the infeed section 10 to the outfeed section 11. The retaining force is properly adjusted in order to give greater stability to articles A with respect to embodiments with through holes provided only on the central belt 2, but at the same time enabling sliding of the side belts 3, 4 under the articles A. In a possible embodiment, the through holes on the side belts may be provided only on the portions adjacent to the stop elements 30, 40.

[0033] As previously indicated, the apparatus 100 comprises an infeed conveyor 8 - schematically illustrated in figure 4 - configured for feeding to the phaser conveyor 1 the articles A spaced apart from each other in said machine direction MD by the first pitch P1. The infeed conveyor 8 can be of the motor-driven-belt type. Preferably, the infeed conveyor 8 comprises a closed-loop belt defining a downwardly facing transport branch 18 aligned with the central belt 2 along the machine direction MD and having a terminal end portion vertically overlapped to the transport branch 20' of the central belt 2 at the infeed section 10. The closed-loop belt of the infeed conveyor 8 has a width - in a direction transversal to said machine direction MD - substantially equal to the width of the central belt 2, so that said terminal end portion does not interfere with the stop elements 30, 40 of the side belts 3, 4. The transport branch 18 of the infeed conveyor 8 may have a width lower than the width of the central belt 2. In any case, if the infeed conveyor 8 is vertically superimposed on the central belt 2, the infeed conveyor 8 has to be arranged so as to not interfere with the stop elements 30, 40 of the side belts 3, 4.

[0034] The infeed conveyor 8 comprises a vacuum grip system which is configured and controlled for holding the articles A conveyed by the infeed conveyor 8 against the downwardly facing transport branch 18 of the infeed conveyor 8 until the article A is released on, and gripped by, the central belt 2 of the phaser conveyor 1. In this respect, the infeed conveyor 8 comprises a plurality of through holes 19 and a stationary suction box connected to a sub-atmospheric pressure source, so as to provide a sucking surface for retaining the conveyed articles A against said downwardly facing transport branch 18 of the infeed conveyor 8 until they are released on the phaser conveyor 1. It is to be noted that, the vacuum gripping condition of the infeed conveyor 8 remains active to retain the articles A on the transport branch 18 during the path in which the through holes 19 are faced to a stationary suction box. The interruption of the retaining action of the infeed conveyor 8 is phased with the beginning of the retaining action of the phaser conveyor 1 at the infeed section 10. The infeed conveyor 8 is phased with the side belts 3, 4, so that the articles A are passed on the infeed section 10 of the phaser conveyor 1 in a position between two consecutive stop elements 30, 40. The presence of the stop elements 30, 40 only on the side belts 3, 4 enables using an infeed conveyor 8 arranged above and between the side belts 3, 4, which does not interfere with the stop elements 30, 40, which ensures a smooth transition of the articles A from the infeed conveyor 8 to the phaser conveyor 1.

[0035] In a possible embodiment, the apparatus comprises an outfeed conveyor 9 operatively connected to the outfeed section 11 of the phaser conveyor 1, arranged for receiving and transporting the articles A spaced by the second pitch P2, after the repitching operation carried out on the phaser conveyor 1. The outfeed conveyor 9 can be arranged similarly to the infeed conveyor 8 previously described.

[0036] The outfeed conveyor 9 is also arranged so as to avoid interference with the stop elements 30, 40 of the side belts 3, 4. In a possible embodiment the outfeed conveyor 9 comprises a closed-loop belt defining a downwardly facing transport branch 22 aligned with the central belt 2 along the machine direction MD and having a first

portion vertically overlapped on the transport branch 20' of the central belt 2 at the outfeed section 11. The closed-loop belt of the outfeed conveyor 9 has a width - in a direction transversal to said machine direction MD - substantially equal to the width of the central belt 2, so that it does not interfere with the stop elements 30, 40 of the side belts 3, 4.

[0037] In a possible embodiment, the outfeed conveyor 9 comprises a vacuum grip system comprising a plurality of through holes 23 formed in the belt of the outfeed conveyor 9, configured and controlled for holding each article A conveyed by the outfeed conveyor 9 against said downwardly facing transport branch 22 of the outfeed conveyor 9. It is to be noted that the interruption of the retaining action of the phaser conveyor 1 at the outfeed section 11 is phased with the beginning of the retaining action of the outfeed conveyor 9.

[0038] Due to the features indicated above, the inlet and outfeed conveyors 8, 9 provide an effective transport of the articles A to and from the phaser conveyor 1, without interference with the stop elements 30, 40. The presence of the stop elements 30, 40 only on the side belts 3, 4 enables infeed and outfeed conveyors 8, 9 arranged above and between the side belts 3, 4, in order to guarantee a smooth transition of the articles A.

[0039] As it is evident from the above description, the present invention provides a solution capable to vary the pitch of a flow of moving articles A in a simple and automatic way, ensuring an effective transport of articles of different types.

[0040] As compared to the rotary repitching devices of the prior art, the invention provides a solution which is much simpler and energy-efficient, which has a positive impact on sustainability.

[0041] Of course, without prejudice to the principle of the invention, the details of construction and the embodiments can be widely varied with respect to those described and illustrated, without thereby departing from the scope of the invention as defined by the claims that follow.

Claims

1. An apparatus (100) for varying the pitch between moving articles (A) comprising:

   - an infeed conveyor (8) configured for feeding a flow of articles (A) along a machine direction (MD) spaced apart from each other in said machine direction (MD) by a first pitch (P1), and
   - a phaser conveyor (1) having an infeed section (10) and an outfeed section (11), wherein the infeed section (10) is configured for receiving said flow of articles (A) from said infeed conveyor (8) spaced apart from each other by said first pitch (P1),

   wherein said phaser conveyor (1) comprises:

   - a closed-loop central belt (2) having a flat support surface (20) configured for receiving thereon said articles (A), the closed-loop central belt (2) having a plurality of through holes (21) open on said support surface (20) and a transport branch (20') extending from said infeed section (10) to said outfeed section (11),
   - a first motor (5) configured to drive said closed-loop central belt (2) at a first speed (V1),
   - a stationary suction box (50) connected to a sub-atmospheric pressure source and having a suction surface facing said transport branch (20') of said closed-loop central belt (2) so as to retain said articles (A) on said transport branch (20') during the movement between the infeed section (10) to the outfeed section (11),
   - two closed-loop side belts (3, 4), having respective branches extending on opposite sides of said transport branch (20') of said closed-loop central belt (2), wherein the closed-loop side belts (3, 4) comprise respective rows of stop elements (30, 40), the stop elements (30, 40) of each closed-loop side belt (3, 4) being spaced apart with respect to each other by a constant distance (X), and wherein the stop elements (30, 40) of each closed-loop side belt (3, 4) are aligned to the stop elements (30, 40) of the other closed-loop side belt (3, 4) in a direction transversal to said machine direction (MD), said stop elements (30, 40) being configured to engage side portions of said articles (A) projecting laterally outside the transport branch (20') of the closed-loop central belt (2),
   - a second motor (6) configured to synchronously drive the closed-loop side belts (3, 4) at a second speed (V2) different from the first speed (V1),
   - wherein - in operation - the phaser conveyor (1) transports articles (A) having width in a direction transversal to said machine direction (MD) greater than the width of the central belt (2), and wherein the speed difference between the closed-loop central belt (2) and the closed-loop side belts (3, 4) causes the articles (A) to come into contact with a pair of transversally aligned stop elements (30, 40) of the closed-loop side belts (3, 4) and sliding of the articles (A) on the closed-loop central belt (2) so that at said outfeed section (11) of the phaser conveyor (1) the articles (A) are spaced by a second pitch (P2) corresponding to said distance (X) between said stop elements (30, 40),
   - **characterised in that** said closed-loop side belts (3, 4) have respective branches facing said stationary suction box (50) and comprise re-

spective through holes so as to retain by vacuum suction lateral portions of said articles (A) projecting laterally outside said closed-loop central belt (2).

2. The apparatus of claim 1, wherein the side belts (3, 4) have respective support surfaces (24, 25) coplanar with the support surface (20) of the transport branch (20') of the central belt (2) so as to form a continuous surface for supporting and transporting the articles (A).

3. The apparatus of claim 1 or 2, wherein the stop elements (30, 40) are ribs protruding from respective flat surfaces.

4. The apparatus of any of the preceding claims, wherein said first speed (V1) of the central belt (2) is higher than said second speed (V2) of the side belts (3, 4), wherein - in operation - an article (A) conveyed on the infeed section (10) of the phaser conveyor (1) reaches a pair of transversally aligned stop elements (30, 40) located in a more advanced position with respect to the article (A), so as to make contact between a leading edge portion of the article (A) and said pair of transversally aligned stop elements (30, 40) at the outfeed section (11) of the phaser conveyor (1).

5. The apparatus of any of claims 1-3, wherein said first speed (V1) of the central belt (2) is lower than said second speed (V2) of the side belts (3, 4), wherein - in operation - an article (A) conveyed on the infeed section (10) of the phaser conveyor (1) is reached by a pair of transversally aligned stop elements (30, 40) located in a back position with respect to the article (A), so as to make contact between a trailing edge portion of the article (A) and said pair of transversally aligned stop elements (30, 40) at the outfeed section (11) of the phaser conveyor (1).

6. The apparatus of any of the preceding claims, wherein said infeed conveyor (8) comprises a closed-loop belt defining a downwardly facing transport branch (18) aligned along the machine direction (MD) with the central belt (2) and having a terminal end portion vertically superimposed on the transport branch (20') of the central belt (2) at the infeed section (10), said closed-loop belt of the infeed conveyor (8) having a width - in a direction transversal to said machine direction (MD) - equal to or smaller than the width of the central belt (2), so that said terminal end portion does not interfere with the stop elements (30, 40) of the side belts (3, 4).

7. The apparatus of claim 1, wherein said through holes of said closed-loop side belts (3, 4) are positioned only on portions of said closed-loop side belts (3, 4) adjacent to said stop elements (30, 40).

8. The apparatus of any of the preceding claims, wherein the closed-loop belt of the infeed conveyor (8) comprises a plurality of through holes (19) and wherein the infeed conveyor (8) comprises a stationary suction box connected to a sub-atmospheric pressure source, so as to retain by vacuum suction said articles (A) against said downwardly facing transport branch (18) of the closed-loop belt of the infeed conveyor (8) until when they are released on the phaser conveyor (1).

9. The apparatus of any of the preceding claims, comprising an outfeed conveyor (9) configured for receiving from the outfeed section (11) of the phaser conveyor (1) said flow of articles (A), spaced apart from each other in said machine direction (MD) by said second pitch (P2).

10. The apparatus of claim 9, wherein said outfeed conveyor (9) comprises a closed-loop belt defining a downwardly facing transport branch (22) aligned along the machine direction (MD) with the central belt (2) and having a first portion vertically superimposed on the transport branch (20') of the central belt (2) at the outfeed section (11), said closed-loop belt of the outfeed conveyor (9) having a width - in a direction transversal to said machine direction (MD) - equal to or smaller than the width of the central belt (2), so that said first portion does not interfere with the stop elements (30, 40) of the side belts (3, 4).

11. A method for varying the pitch between moving articles (A), including:

- feeding a flow of articles (A) along a machine direction (MD) spaced apart from each other in said machine direction (MD) by a first pitch (P1),
- receiving said flow of articles (A) spaced apart from each other by said first pitch (P1) on a closed-loop central belt (2) having a transport branch (20') extending between an infeed section (10) and an outfeed section (11),
- retaining said articles (A) on said transport branch (20') of the closed-loop central belt (2) by vacuum suction during the movement between the infeed section (10) to the outfeed section (11), wherein said articles (A) have a width in a direction transversal to said machine direction (MD) greater than the width of said closed-loop central belt (2) so that said articles (A) have lateral portions projecting laterally outside said closed-loop central belt (2),
- driving said closed-loop central belt (2) at a first speed (V1),
- providing a pair of closed-loop side belts (3, 4) extending on opposite sides of said transport

branch (20') of said closed-loop central belt (2), wherein the closed-loop side belts (3, 4) comprise respective rows of stop elements (30, 40), the stop elements (30, 40) of each closed-loop side belt (3, 4) being spaced apart with respect to each other by a constant distance (X), and wherein the stop elements (30, 40) of each side belt (3, 4) are aligned to the stop elements (30, 40) of the other belt (3, 4) in a direction transversal to said machine direction (MD), wherein said closed-loop side belts (3, 4) have respective branches facing a stationary suction box (50) and comprise respective through holes so as to retain by vacuum suction lateral portions of said articles (A) projecting laterally outside said closed-loop central belt (2),

- synchronously driving said closed-loop side belts (3, 4) at a second speed (V2) different from said first speed (V1),
- engaging said lateral portions of said articles (A) projecting outside to closed-loop central belt (2) with respective pairs of transversally aligned stop elements (30, 40) of said closed-loop side belts (3, 4), and spacing said articles (A) from each other in said machine direction (MD) at said outfeed section (11) by a second pitch (P2) corresponding to said distance (X) between said stop elements (30, 40),
- retaining by vacuum suction lateral portions of said articles (A) projecting laterally outside said closed-loop central belt (2) on said closed-loop side belts (3, 4).

12. The method of claim 11, wherein said first speed (V1) of the central belt (2) is higher than the second speed (V2) of the side belts (3, 4), wherein - in operation - an article (A) conveyed on the infeed section (10) of the phaser conveyor (1) reaches a pair of transversally aligned stop elements (30, 40) located in a more advanced position with respect to the article (A), so as to make contact between a leading edge portion of the article (A) and said pair of transversally aligned stop elements (30, 40) at the outfeed section (11) of the phaser conveyor (1).

13. The method of claim 11, wherein the first speed (V1) of the central belt (2) is lower than the second speed (V2) of the side belts (3, 4), wherein - in operation - an article (A) conveyed on the infeed section (10) of the phaser conveyor (1) is reached by a pair of transversally aligned stop elements (30, 40) located in a back position with respect to the article (A), so as to make contact between a trailing edge portion of the article (A) and said pair of transversally aligned stop elements (30, 40) at the outfeed section (11) of the phaser conveyor (1).

Patentansprüche

1. Vorrichtung (100) zur Veränderung des Abstands zwischen sich bewegenden Gegenständen (A), umfassend:

- einen Einlaufförderer (8), der so konfiguriert ist, dass er einen Strom von Gegenständen (A) entlang einer Maschinenrichtung (MD) zuführt, die in der Maschinenrichtung (MD) um einen ersten Abstand (P1) voneinander beabstandet sind, und
- einen Phaserförderer (1), der einen Einlaufabschnitt (10) und einen Auslaufabschnitt (11) aufweist, wobei der Einlaufabschnitt (10) so konfiguriert ist, dass er den Strom von Gegenständen (A) von dem Einlaufförderer (8) empfängt, die um den ersten Abstand (P1) voneinander beabstandet sind,

wobei der Phaserförderer (1) Folgendes umfasst:

- ein zentrales Band in geschlossener Schleife (2) mit einer flachen Stützfläche (20), die zur Aufnahme der Gegenstände (A) darauf konfiguriert ist, wobei das zentrale Band in geschlossener Schleife (2) eine Vielzahl von Durchgangslöchern (21), die auf der Stützfläche (20) offen sind, und einen Transportzweig (20') aufweist, der sich von dem Einlaufabschnitt (10) zu dem Auslaufabschnitt (11) erstreckt,
- einen ersten Motor (5), der so konfiguriert ist, dass er das zentrale Band in geschlossener Schleife (2) mit einer ersten Geschwindigkeit (V1) antreibt,
- einen stationären Saugkasten (50), der mit einer subatmosphärischen Druckquelle verbunden ist und eine Saugfläche aufweist, die dem Transportzweig (20') des zentralen Bandes in geschlossener Schleife (2) zugewandt ist, um die Gegenstände (A) während der Bewegung zwischen dem Einlaufabschnitt (10) und dem Auslaufabschnitt (11) auf dem Transportzweig (20') zu halten,
- zwei Seitenbänder in geschlossener Schleife (3, 4), die jeweilige Zweige aufweisen, die sich auf gegenüberliegenden Seiten des Transportzweigs (20') des zentralen Bandes in geschlossener Schleife (2) erstrecken, wobei die Seitenbänder in geschlossener Schleife (3, 4) jeweilige Reihen von Anschlagelementen (30, 40) umfassen, wobei die Anschlagelemente (30, 40) jedes Seitenbandes in geschlossener Schleife (3, 4) um einen konstanten Abstand (X) voneinander beabstandet sind, und wobei die Anschlagelemente (30, 40) jedes Seitenbandes in geschlossener Schleife (3, 4) mit den Anschlagelementen (30, 40) des anderen Seitenbandes

in geschlossener Schleife (3, 4) in einer Richtung quer zu der Maschinenrichtung (MD) ausgerichtet sind, wobei die Anschlagelemente (30, 40) so konfiguriert sind, dass sie mit Seitenabschnitten der Gegenstände (A) in Eingriff kommen, die seitlich aus dem Transportzweig (20') des zentralen Bandes in geschlossener Schleife (2) herausragen,

- einen zweiten Motor (6), der so konfiguriert ist, dass er die Seitenbänder in geschlossener Schleife (3, 4) synchron mit einer zweiten Geschwindigkeit (V2) antreibt, die sich von der ersten Geschwindigkeit (V1) unterscheidet,
- wobei - im Betrieb - der Phaserförderer (1) Gegenstände (A) transportiert, deren Breite in einer Richtung quer zu der Maschinenrichtung (MD) größer ist als die Breite des zentralen Bandes (2), und wobei der Geschwindigkeitsunterschied zwischen dem zentralen Band in geschlossener Schleife (2) und den Seitenbändern in geschlossener Schleife (3, 4) bewirkt, dass die Gegenstände (A) mit einem Paar quer ausgerichteter Anschlagelemente (30, 40) der Seitenbänder in geschlossener Schleife (3, 4) in Kontakt kommen und die Gegenstände (A) auf dem zentralen Band in geschlossener Schleife (2) gleiten, so dass die Gegenstände (A) an dem Auslaufabschnitt (11) des Phaserförderers (1) um einen zweiten Abstand (P2) beabstandet sind, der dem Abstand (X) zwischen den Anschlagelementen (30, 40) entspricht,
- **dadurch gekennzeichnet, dass** die Seitenbänder in geschlossener Schleife (3, 4) jeweils dem stationären Saugkasten (50) zugewandte Zweige aufweisen und jeweilige Durchgangslöcher umfassen, um durch Vakuumansaugung seitliche Abschnitte der Gegenstände (A) zu halten, die seitlich aus dem zentralen Band in geschlossener Schleife (2) herausragen.

2. Vorrichtung nach Anspruch 1, wobei die Seitenbänder (3, 4) jeweilige Stützflächen (24, 25) aufweisen, die mit der Stützfläche (20) des Transportzweigs (20') des zentralen Bandes (2) koplanar sind, um eine durchgehende Fläche zum Stützen und Transportieren der Gegenstände (A) zu bilden.

3. Vorrichtung nach Anspruch 1 oder 2, wobei es sich bei den Anschlagelementen (30, 40) um Rippen handelt, die aus den jeweiligen ebenen Flächen herausragen.

4. Vorrichtung nach einem der vorstehenden Ansprüche, wobei die erste Geschwindigkeit (V1) des zentralen Bandes (2) höher ist als die zweite Geschwindigkeit (V2) der Seitenbänder (3, 4), wobei - im Betrieb - ein auf dem Einlaufabschnitt (10) des Phaserförderers (1) beförderter Gegenstand (A) ein Paar quer ausgerichteter Anschlagelemente (30, 40) erreicht, die sich in einer weiter fortgeschrittenen Position in Bezug auf den Gegenstand (A) befinden, so dass ein Kontakt zwischen einem Vorderkantenabschnitt des Gegenstands (A) und dem Paar quer ausgerichteter Anschlagelemente (30, 40) an dem Auslaufabschnitt (11) des Phaserförderers (1) hergestellt wird.

5. Vorrichtung nach einem der Ansprüche 1-3, wobei die erste Geschwindigkeit (V1) des zentralen Bandes (2) niedriger ist als die zweite Geschwindigkeit (V2) der Seitenbänder (3, 4), wobei - im Betrieb - ein auf dem Einlaufabschnitt (10) des Phaserförderers (1) beförderter Gegenstand (A) von einem Paar quer ausgerichteter Anschlagelemente (30, 40) erreicht wird, die sich in einer hinteren Position in Bezug auf den Gegenstand (A) befinden, so dass ein Kontakt zwischen einem hinteren Kantenabschnitt des Gegenstand (A) und dem Paar quer ausgerichteter Anschlagelemente (30, 40) an dem Auslaufabschnitt (11) des Phaserförderers (1) hergestellt wird.

6. Vorrichtung nach einem der vorstehenden Ansprüche, wobei der Einlaufförderer (8) ein Band in geschlossener Schleife umfasst, das einen nach unten weisenden Transportzweig (18) definiert, der entlang der Maschinenrichtung (MD) mit dem zentralen Band (2) ausgerichtet ist und einen beendenden Endabschnitt aufweist, der vertikal über den Transportzweig (20') des zentralen Bandes (2) an dem Einlaufabschnitt (10) gelegt ist, wobei das Band in geschlossener Schleife des Einlaufförderers (8) eine Breite - in einer Richtung quer zu der Maschinenrichtung (MD) - aufweist, die gleich oder kleiner als die Breite des zentralen Bandes (2) ist, so dass der beendende Endabschnitt nicht mit den Anschlagelementen (30, 40) der Seitenbänder (3, 4) kollidiert.

7. Vorrichtung nach Anspruch 1, wobei die Durchgangslöcher der Seitenbänder in geschlossener Schleife (3, 4) nur an Abschnitten der Seitenbänder in geschlossener Schleife (3, 4) positioniert sind, die an die Anschlagelemente (30, 40) angrenzen.

8. Vorrichtung nach einem der vorstehenden Ansprüche, wobei das Band in geschlossener Schleife des Einlaufförderers (8) eine Vielzahl von Durchgangslöchern (19) umfasst und wobei der Einlaufförderer (8) einen stationären Saugkasten umfasst, der mit einer subatmosphärischen Druckquelle verbunden ist, um die Gegenstände (A) durch Vakuumansaugung gegen den nach unten weisenden Transportzweig (18) des Bandes in geschlossener Schleife des Einlaufförderers (8) zu halten, bis sie auf dem Phaserförderer (1) freigegeben werden.

9. Vorrichtung nach einem der vorstehenden Ansprü-

che, die einen Auslaufförderer (9) umfasst, der so konfiguriert ist, dass er von dem Auslaufabschnitt (11) des Phaserförderers (1) den Strom von Gegenständen (A) aufnimmt, die in der Maschinenrichtung (MD) um den zweiten Abstand (P2) voneinander beabstandet sind.

10. Vorrichtung nach Anspruch 9, wobei der Auslaufförderer (9) ein Band in geschlossener Schleife umfasst, das einen nach unten weisenden Transportzweig (22) definiert, der entlang der Maschinenrichtung (MD) mit dem zentralen Band (2) ausgerichtet ist und einen ersten Abschnitt aufweist, der vertikal über den Transportzweig (20') des zentralen Bandes (2) an dem Auslaufabschnitt (11) gelegt ist, wobei das Band in geschlossener Schleife des Auslaufförderers (9) eine Breite - in einer Richtung quer zu der Maschinenrichtung (MD) - aufweist, die gleich oder kleiner als die Breite des zentralen Bandes (2) ist, so dass der erste Abschnitt nicht mit den Anschlagelementen (30, 40) der Seitenbänder (3, 4) kollidiert.

11. Verfahren zur Veränderung des Abstandes zwischen sich bewegenden Gegenständen (A), einschließlich:

- Zuführen eines Stroms von Gegenständen (A) entlang einer Maschinenrichtung (MD), die in der Maschinenrichtung (MD) um einen ersten Abstand (P1) voneinander beabstandet sind,
- Aufnehmen des Stroms von Gegenständen (A), die um den ersten Abstand (P1) voneinander beabstandet sind, auf einem zentralen Band in geschlossener Schleife (2), das einen Transportzweig (20') aufweist, der sich zwischen einem Einlaufabschnitt (10) und einem Auslaufabschnitt (11) erstreckt,
- Halten der Gegenstände (A) auf dem Transportzweig (20') des zentralen Bandes in geschlossener Schleife (2) durch Vakuumansaugung während der Bewegung zwischen dem Einlaufabschnitt (10) und dem Auslaufabschnitt (11), wobei die Gegenstände (A) eine Breite in einer Richtung quer zu der Maschinenrichtung (MD) aufweisen, die größer ist als die Breite des zentralen Bandes in geschlossener Schleife (2), so dass die Gegenstände (A) seitliche Abschnitte aufweisen, die seitlich aus dem zentralen Band in geschlossener Schleife (2) herausragen,
- Antreiben des zentralen Bandes in geschlossener Schleife (2) mit einer ersten Geschwindigkeit (V1),
- Bereitstellen eines Paars von Seitenbändern in geschlossener Schleife (3, 4), die sich auf gegenüberliegenden Seiten des Transportzweigs (20') des zentralen Bandes in geschlossener Schleife (2) erstrecken, wobei die Seitenbänder in geschlossener Schleife (3, 4) jeweilige Reihen von Anschlagelementen (30, 40) umfassen, wobei die Anschlagelemente (30, 40) jedes Seitenbandes in geschlossener Schleife (3, 4) um einen konstanten Abstand (X) voneinander beabstandet sind, und wobei die Anschlagelemente (30, 40) jedes Seitenbandes (3, 4) mit den Anschlagelementen (30, 40) des anderen Bandes (3, 4) in einer Richtung quer zu der Maschinenrichtung (MD) ausgerichtet sind, wobei die Seitenbänder in geschlossener Schleife (3, 4) jeweilige Zweige aufweisen, die einem stationären Saugkasten (50) zugewandt sind, und jeweilige Durchgangslöcher umfassen, um durch Vakuumsaugen seitliche Abschnitte der Gegenstände (A) zu halten, die seitlich aus dem zentralen Band in geschlossener Schleife (2) herausragen,
- synchrones Antreiben der Seitenbänder in geschlossener Schleife (3, 4) mit einer zweiten Geschwindigkeit (V2), die sich von der ersten Geschwindigkeit (V1) unterscheidet,
- Ineingriffbringen der seitlichen Abschnitte der Gegenstände (A), die aus dem zentralen Band in geschlossener Schleife (2) herausragen, mit entsprechenden Paaren von quer ausgerichteten Anschlagelementen (30, 40) der Seitenbänder in geschlossener Schleife (3, 4), und Beabstanden der Gegenstände (A) voneinander in der Maschinenrichtung (MD) an dem Auslaufabschnitt (11) um einen zweiten Abstand (P2), der dem Abstand (X) zwischen den Anschlagelementen (30, 40) entspricht,
- Halten von seitlichen Abschnitten der Gegenstände (A), die seitlich aus dem zentralen Band in geschlossener Schleife (2) herausragen, auf den Seitenbändern in geschlossener Schleife (3, 4) durch Vakuumansaugung.

12. Verfahren nach Anspruch 11, wobei die erste Geschwindigkeit (V1) des zentralen Bandes (2) höher ist als die zweite Geschwindigkeit (V2) der Seitenbänder (3, 4), wobei - im Betrieb - ein auf dem Einlaufabschnitt (10) des Phaserförderers (1) beförderter Gegenstand (A) ein Paar quer ausgerichteter Anschlagelemente (30, 40) erreicht, die sich in einer weiter fortgeschrittenen Position in Bezug auf den Gegenstand (A) befinden, so dass ein Kontakt zwischen einem Vorderkantenabschnitt des Gegenstands (A) und dem Paar quer ausgerichteter Anschlagelemente (30, 40) an dem Auslaufabschnitt (11) des Phaserförderers (1) hergestellt wird.

13. Verfahren nach Anspruch 11, wobei die erste Geschwindigkeit (V1) des zentralen Bandes (2) niedriger ist als die zweite Geschwindigkeit (V2) der Seitenbänder (3, 4), wobei - im Betrieb - ein auf dem Einlaufabschnitt (10) des Phaserförderers (1) beför-

derter Gegenstand (A) von einem Paar quer ausgerichteter Anschlagelemente (30, 40) erreicht wird, die sich in einer hinteren Position in Bezug auf den Gegenstand (A) befinden, so dass ein Kontakt zwischen einem hinteren Kantenabschnitt des Gegenstand (A) und dem Paar quer ausgerichteter Anschlagelemente (30, 40) an dem Auslaufabschnitt (11) des Phaserförderers (1) hergestellt wird.

Revendications

1. Appareil (100) pour faire varier le pas entre des articles (A) en mouvement comprenant :

- un convoyeur (8) d'alimentation configuré pour alimenter un flux d'articles (A) le long d'une direction (MD) de machine espacés les uns des autres dans ladite direction (MD) de machine par un premier pas (P1), et
- un convoyeur (1) de phasage ayant une section (10) d'alimentation et une section (11) d'évacuation, dans lequel la section (10) d'alimentation est configurée pour recevoir ledit flux d'articles (A) dudit convoyeur (8) d'alimentation espacés les uns des autres par ledit premier pas (P1),
dans lequel ledit convoyeur (1) de phasage comprend :

  - une courroie (2) centrale en boucle fermée ayant une surface (20) de support plate configurée pour recevoir sur celle-ci lesdits articles (A), la courroie (2) centrale en boucle fermée ayant une pluralité d'orifices (21) traversants ouverts sur ladite surface (20) de support et une branche (20') de transport s'étendant de ladite section (10) d'alimentation à ladite section (11) d'évacuation,

  un premier moteur (5) configuré pour entraîner ladite courroie (2) centrale en boucle fermée à une première vitesse (V1),

  - une boîte (50) d'aspiration stationnaire reliée à une source de pression sous-atmosphérique et ayant une surface d'aspiration orientée vers ladite branche (20') de transport de ladite courroie (2) centrale en boucle fermée de manière à retenir lesdits articles (A) sur ladite branche (20') de transport pendant le déplacement entre la section (10) d'alimentation et la section (11) d'évacuation,
  - deux courroies (3, 4) latérales en boucle fermée, ayant des branches respectives s'étendant sur des côtés opposés de ladite branche (20') de transport de ladite courroie (2) centrale en boucle fermée, dans lesquelles les courroies (3, 4) latérales en boucle fermée comprennent des rangées respectives d'éléments (30, 40) d'arrêt, les éléments (30, 40) d'arrêt de chaque courroie (3, 4) latérale en boucle fermée étant espacés les uns des autres d'une distance (X) constante, et dans lesquelles les éléments (30, 40) d'arrêt de chaque courroie (3, 4) latérale en boucle fermée sont alignés sur les éléments (30, 40) d'arrêt de l'autre courroie (3, 4) latérale en boucle fermée dans une direction transversale à ladite direction (MD) de machine, lesdits éléments (30, 40) d'arrêt étant configurés pour mettre en prise des parties latérales desdits articles (A) faisant saillie latéralement à l'extérieur de la branche (20') de transport de la courroie (2) centrale en boucle fermée,
  - un second moteur (6) configuré pour entraîner de manière synchrone les courroies (3, 4) latérales en boucle fermée à une seconde vitesse (V2) différente de la première vitesse (V1),
  - dans lequel - en fonctionnement - le convoyeur (1) de phasage transporte des articles (A) ayant une largeur dans une direction transversale à ladite direction (MD) de machine supérieure à la largeur de la courroie (2) centrale, et dans lequel la différence de vitesse entre la courroie (2) centrale en boucle fermée et les courroies (3, 4) latérales en boucle fermée entraîne un contact des articles (A) avec une paire d'éléments (30, 40) d'arrêt alignés transversalement des courroies (3, 4) latérales en boucle fermée et un glissement des articles (A) sur la courroie (2) centrale en boucle fermée de sorte qu'au niveau de ladite section (11) d'évacuation du convoyeur (1) de phasage les articles (A) soient espacés d'un second pas (P2) correspondant à ladite distance (X) entre lesdits éléments (30, 40) d'arrêt,
  - **caractérisé en ce que** lesdites courroies (3, 4) latérales en boucle fermée ont des branches respectives orientées vers ladite boîte (50) d'aspiration stationnaire et comprennent des orifices traversants respectifs de manière à retenir par aspiration sous vide des parties latérales desdits articles (A) faisant saillie latéralement à l'extérieur de ladite courroie (2) centrale en boucle fermée.

2. Appareil selon la revendication 1, dans lequel les courroies (3, 4) latérales ont des surfaces (24, 25) de support respectives coplanaires avec la surface (20)

de support de la branche (20') de transport de la courroie (2) centrale de manière à former une surface continue pour soutenir et transporter les articles (A).

3. Appareil selon la revendication 1 ou la revendication 2, dans lequel les éléments (30, 40) d'arrêt sont des nervures faisant saillie depuis des surfaces plates respectives.

4. Appareil selon l'une quelconque des revendications précédentes, dans lequel ladite première vitesse (V1) de la courroie (2) centrale est supérieure à ladite seconde vitesse (V2) des courroies (3, 4) latérales, dans lequel - en fonctionnement - un article (A) transporté sur la section (10) d'alimentation du convoyeur (1) de phasage atteint une paire d'éléments (30, 40) d'arrêt alignés transversalement situés dans une position plus avancée par rapport à l'article (A), de manière à établir un contact entre une partie de bord d'attaque de l'article (A) et ladite paire d'éléments (30, 40) d'arrêt alignés transversalement au niveau de la section (11) d'évacuation du convoyeur (1) de phasage.

5. Appareil selon l'une quelconque des revendications 1 à 3, dans lequel ladite première vitesse (V1) de la courroie (2) centrale est inférieure à ladite seconde vitesse (V2) des courroies (3, 4) latérales, dans lequel - en fonctionnement - un article (A) transporté sur la section (10) d'alimentation du convoyeur (1) de phasage est atteint par une paire d'éléments (30, 40) d'arrêt alignés transversalement situés en position arrière par rapport à l'article (A), de manière à établir un contact entre une partie de bord de fuite de l'article (A) et ladite paire d'éléments (30, 40) d'arrêt alignés transversalement au niveau de la section (11) d'évacuation du convoyeur (1) de phasage.

6. Appareil selon l'une quelconque des revendications précédentes, dans lequel ledit convoyeur (8) d'alimentation comprend une courroie en boucle fermée définissant une branche (18) de transport orientée vers le bas alignée le long de la direction (MD) de machine avec la courroie (2) centrale et ayant une partie d'extrémité terminale superposée verticalement sur la branche (20') de transport de la courroie (2) centrale au niveau de la section (10) d'alimentation, ladite courroie en boucle fermée du convoyeur (8) d'alimentation ayant une largeur - dans une direction transversale à ladite direction (MD) de machine - égale ou inférieure à la largeur de la courroie (2) centrale, de sorte que ladite partie d'extrémité terminale n'interfère pas avec les éléments (30, 40) d'arrêt des courroies (3, 4) latérales.

7. Appareil selon la revendication 1, dans lequel lesdits orifices traversants desdites courroies (3, 4) latérales en boucle fermée sont positionnés uniquement sur des parties desdites courroies (3, 4) latérales en boucle fermée adjacentes auxdits éléments (30, 40) d'arrêt.

8. Appareil selon l'une quelconque des revendications précédentes, dans lequel la courroie en boucle fermée du convoyeur (8) d'alimentation comprend une pluralité d'orifices (19) traversants et dans lequel le convoyeur (8) d'alimentation comprend une boîte d'aspiration stationnaire connectée à une source de pression sous-atmosphérique, de manière à retenir par aspiration sous vide lesdits articles (A) contre ladite branche (18) de transport orientée vers le bas de la courroie en boucle fermée du convoyeur (8) d'alimentation jusqu'à ce qu'ils soient libérés sur le convoyeur (1) de phasage.

9. Appareil selon l'une quelconque des revendications précédentes, comprenant un convoyeur (9) d'évacuation configuré pour recevoir de la section (11) d'évacuation du convoyeur (1) de phasage ledit flux d'articles (A), espacés les uns des autres dans ladite direction (MD) de machine par ledit second pas (P2).

10. Appareil selon la revendication 9, dans lequel ledit convoyeur (9) d'évacuation comprend une courroie en boucle fermée définissant une branche (22) de transport orientée vers le bas alignée le long de la direction (MD) de machine avec la courroie (2) centrale et ayant une première partie superposée verticalement sur la branche (20') de transport de la courroie (2) centrale au niveau de la section (11) d'évacuation, ladite courroie en boucle fermée du convoyeur (9) d'évacuation ayant une largeur - dans une direction transversale à ladite direction (MD) de machine - égale ou inférieure à la largeur de la courroie (2) centrale, de sorte que ladite première partie n'interfère pas avec les éléments (30, 40) d'arrêt des courroies (3, 4) latérales.

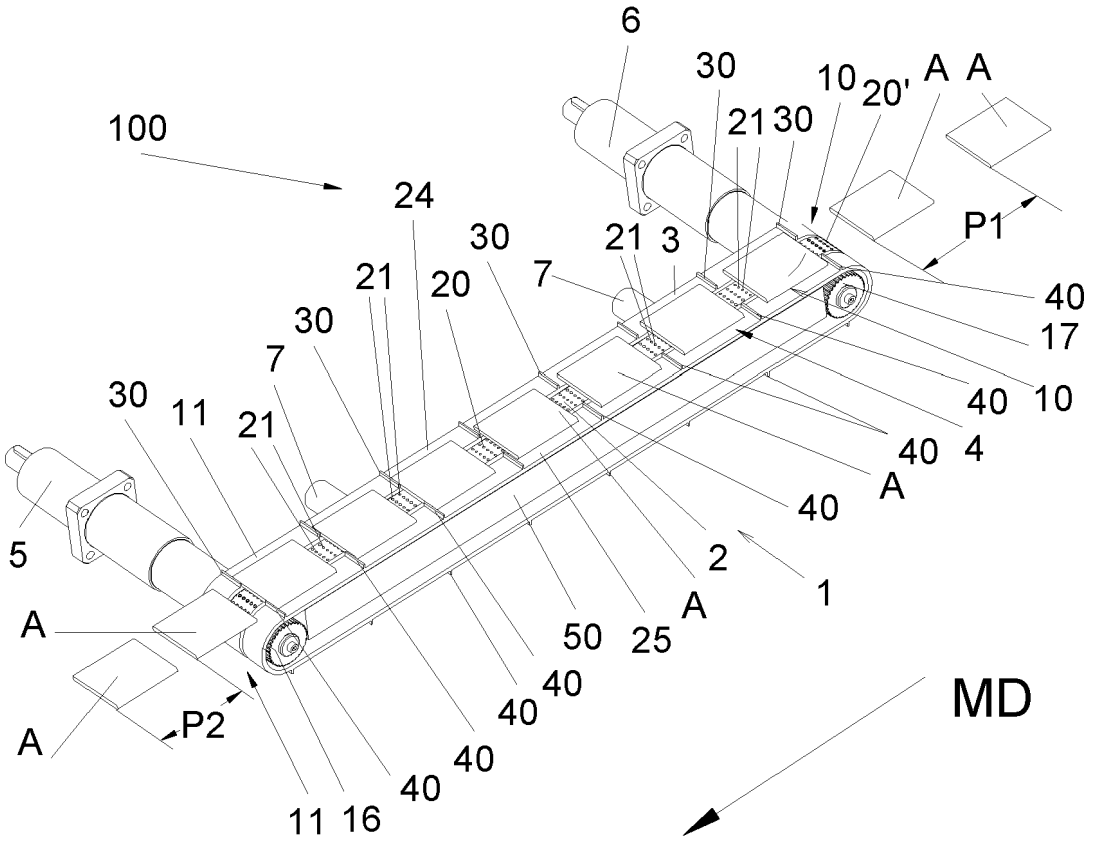
11. Procédé de variation du pas entre des articles (A) en mouvement, incluant :

- une alimentation d'un flux d'articles (A) le long d'une direction (MD) de machine espacés les uns des autres dans ladite direction (MD) de machine par un premier pas (P1),
- une réception dudit flux d'articles (A) espacés les uns des autres par ledit premier pas (P1) sur une courroie (2) centrale en boucle fermée ayant une branche (20') de transport s'étendant entre une section (10) d'alimentation et une section (11) d'évacuation,
- un maintien desdits articles (A) sur ladite branche (20') de transport de la courroie (2) centrale en boucle fermée par aspiration sous vide lors du déplacement entre la section (10) d'alimen-

tation et la section (11) d'évacuation, dans lequel lesdits articles (A) ont une largeur dans une direction transversale à ladite direction (MD) de machine supérieure à la largeur de ladite courroie (2) centrale en boucle fermée de sorte que lesdits articles (A) ont des parties latérales faisant saillie latéralement à l'extérieur de ladite courroie (2) centrale en boucle fermée,
- un entraînement de ladite courroie (2) centrale en boucle fermée à une première vitesse (V1),
- une fourniture d'une paire de courroies (3, 4) latérales en boucle fermée s'étendant sur des côtés opposés de ladite branche (20') de transport de ladite courroie (2) centrale en boucle fermée, dans lequel les courroies (3, 4) latérales en boucle fermée comprennent des rangées respectives d'éléments (30, 40) d'arrêt, les éléments (30, 40) d'arrêt de chaque courroie (3, 4) latérale en boucle fermée étant espacés les uns des autres d'une distance (X) constante, et dans lequel les éléments (30, 40) d'arrêt de chaque courroie (3, 4) latérale sont alignés sur les éléments (30, 40) d'arrêt de l'autre courroie (3, 4) dans une direction transversale à ladite direction (MD) de machine, dans lequel lesdites courroies (3, 4) latérales en boucle fermée ont des branches respectives orientées vers une boîte (50) d'aspiration stationnaire et comprennent des orifices traversants respectifs de manière à retenir par aspiration sous vide des parties latérales desdits articles (A) faisant saillie latéralement à l'extérieur de ladite courroie (2) centrale en boucle fermée,
- un entraînement synchrone desdites courroies (3, 4) latérales en boucle fermée à une seconde vitesse (V2) différente de ladite première vitesse (V1),
- une mise en prise desdites parties latérales desdits articles (A) faisant saillie vers l'extérieur vers la courroie (2) centrale en boucle fermée avec des paires respectives d'éléments (30, 40) d'arrêt alignés transversalement desdites courroies (3, 4) latérales en boucle fermée, et l'espacement desdits articles (A) les uns des autres dans ladite direction (MD) de machine au niveau de ladite section (11) d'évacuation par un second pas (P2) correspondant à ladite distance (X) entre lesdits éléments (30, 40) d'arrêt,
- une rétention par aspiration sous vide de parties latérales desdits articles (A) faisant saillie latéralement à l'extérieur de ladite courroie (2) centrale en boucle fermée sur lesdites courroies (3, 4) latérales en boucle fermée.

12. Procédé selon la revendication 11, dans lequel ladite première vitesse (V1) de la courroie (2) centrale est supérieure à la seconde vitesse (V2) des courroies (3, 4) latérales, dans lequel - en fonctionnement - un article (A) transporté sur la section (10) d'alimentation du convoyeur (1) de phasage atteint une paire d'éléments (30, 40) d'arrêt alignés transversalement situés dans une position plus avancée par rapport à l'article (A), de manière à établir un contact entre une partie de bord d'attaque de l'article (A) et ladite paire d'éléments (30, 40) d'arrêt alignés transversalement au niveau de la section (11) d'évacuation du convoyeur (1) de phasage.

13. Procédé selon la revendication 11, dans lequel la première vitesse (V1) de la courroie (2) centrale est inférieure à la seconde vitesse (V2) des courroies (3, 4) latérales, dans lequel - en fonctionnement - un article (A) transporté sur la section (10) d'alimentation du convoyeur (1) de phasage est atteint par une paire d'éléments (30, 40) d'arrêt alignés transversalement situés en position arrière par rapport à l'article (A), de manière à établir un contact entre une partie de bord de fuite de l'article (A) et ladite paire d'éléments (30, 40) d'arrêt alignés transversalement au niveau de la section (11) d'évacuation du convoyeur (1) de phasage.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A
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21
30
24
P1
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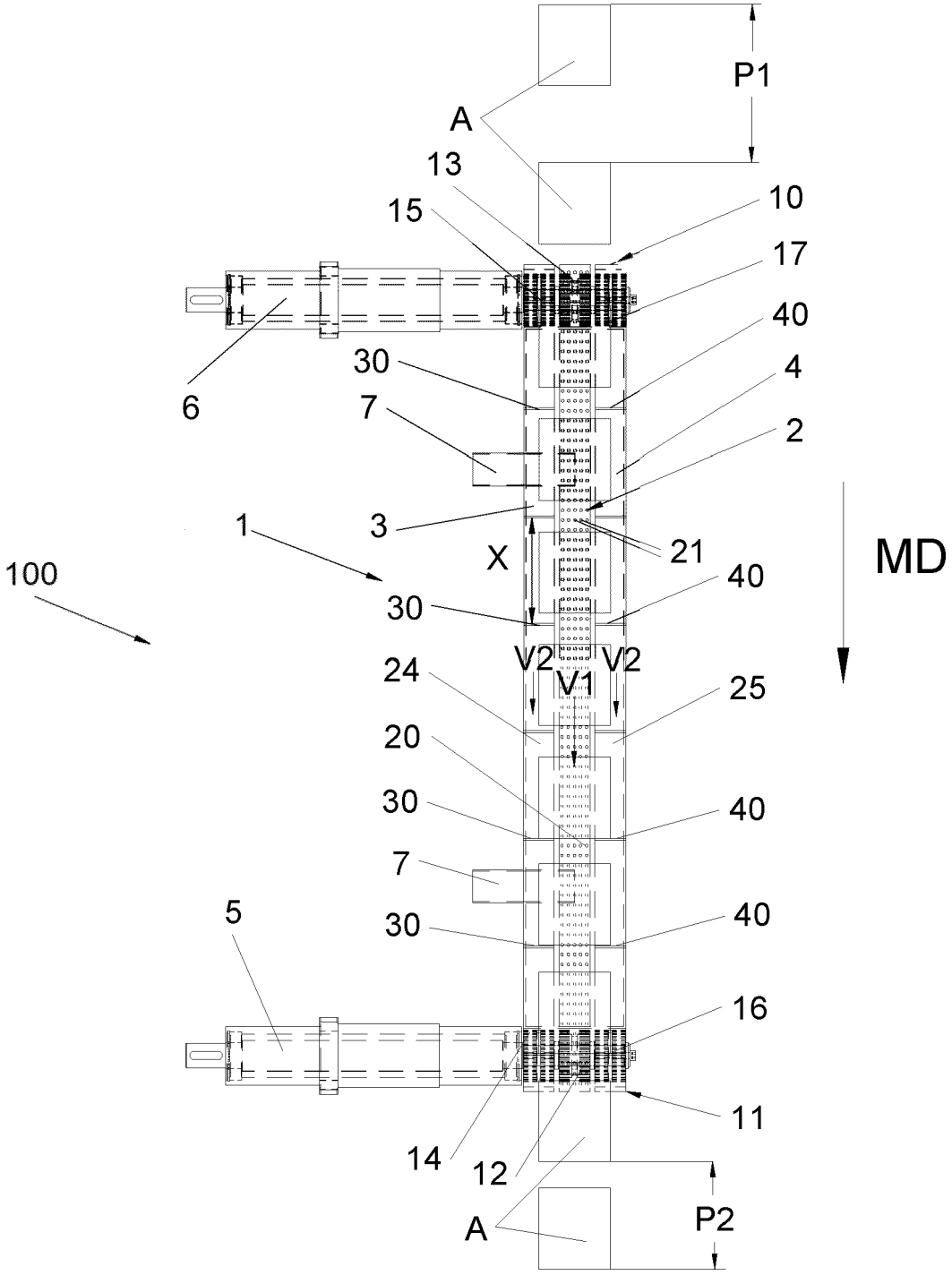
21
3
21
20
7
40
30
17
7
40
10
30
11
21
40
4
A
40
5
2
1
A
50
25
A
40
40
P2
40
40
11
16
MD

fig.1


P1
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2
30
7
6
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3
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40
V2
V1
V2
24
25
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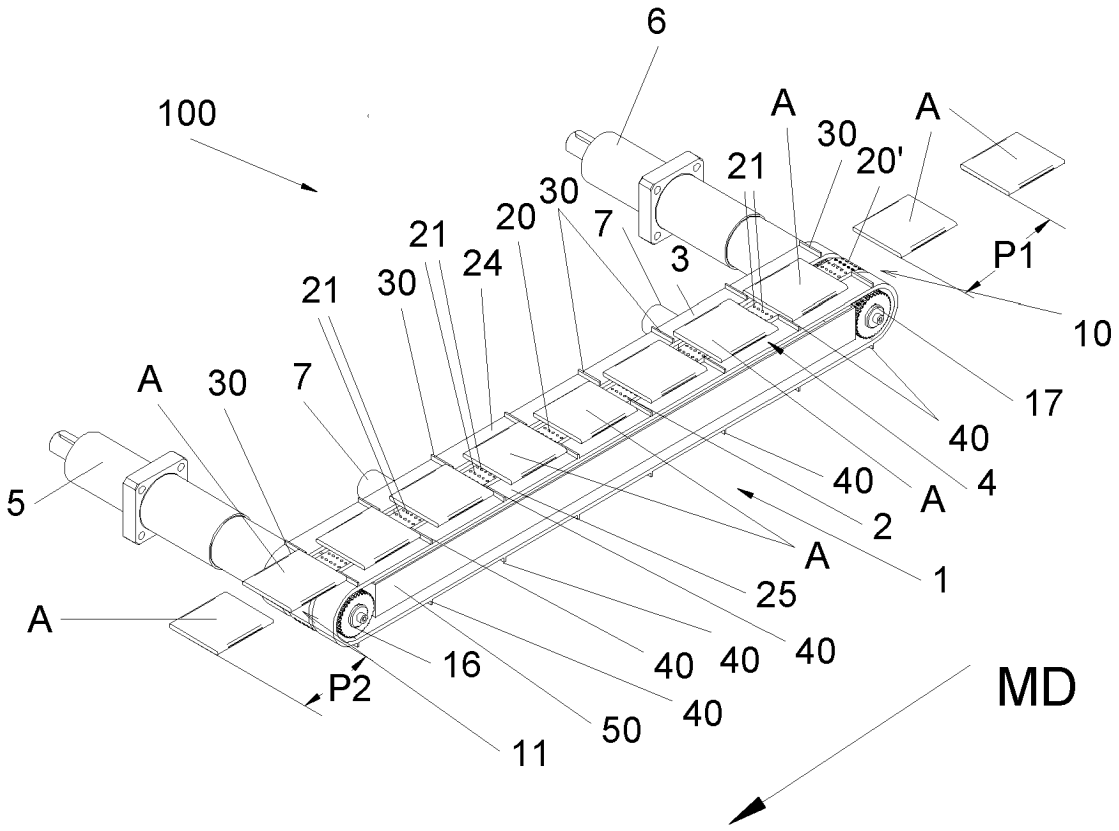
30
40
7
5
30
40
16
11
14
12
A
P2

fig.2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4
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16
P2
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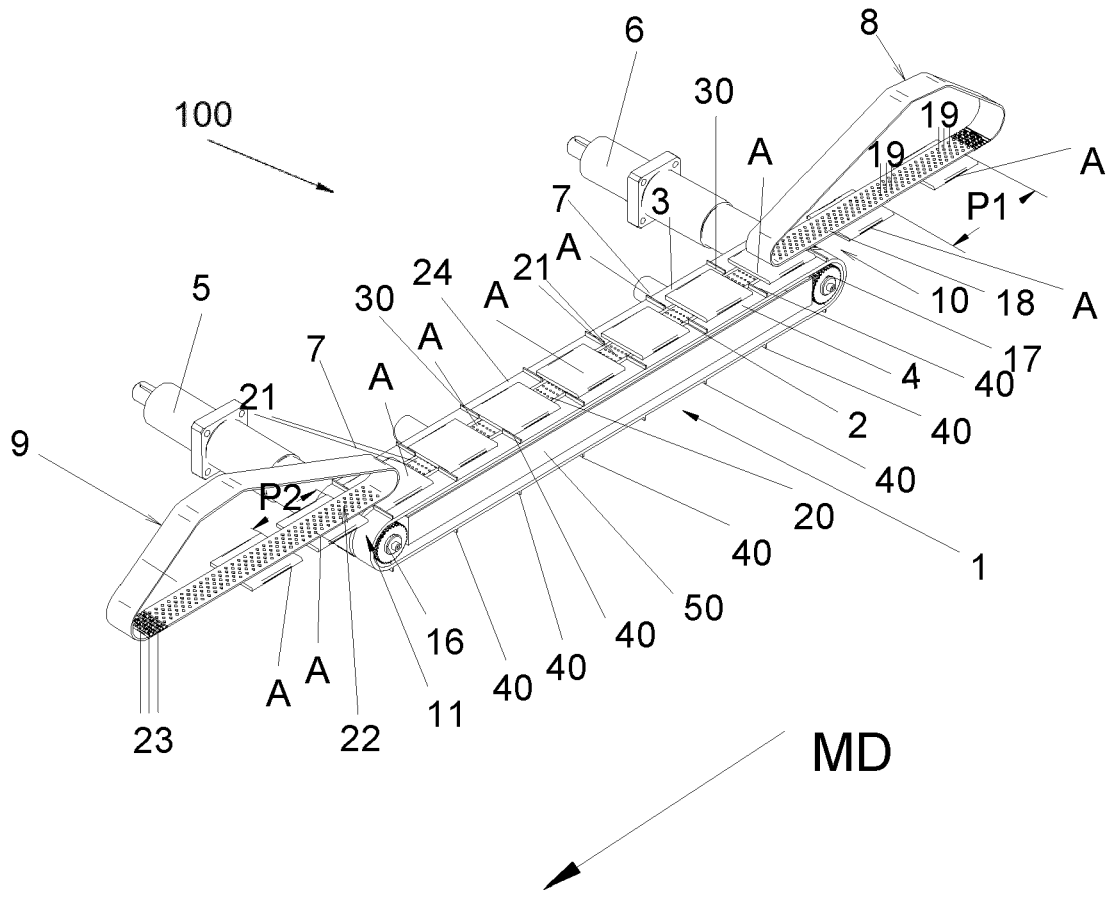
11
MD

fig.3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A
17
4
40
21
2
40
9
40
P2
20
40
1
50
40
16
40
40
A
A
11
22
23
MD

fig.4

REFERENCES CITED IN THE DESCRIPTION

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